DOCUMENT RESUME

ED 391 648 SE 057 161

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TITLE Making Fun Learning.
PUB DATE Oct 94
NOTE 24p.; Paper presented at the Second Coalition for Education in the Outdoors National Conference (Cortland, NY, October 7-10, 1994).
PUB TYPE Viewpoints (Opinion/Position Papers, Essays, etc.) (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Secondary Education; *Environmental Education; Learning Activities; *Outdoor Activities; *Recreational Programs

ABSTRACT

Outdoor recreation programs are valuable because they always permit, and always can promote interactions between participants and natural elements of the environment. Because such programs provide direct, personal experience in the outdoors, they should also seek to provide participants with a basic understanding of, and an appreciation for the interrelationships that exist in the environment and between humans and the environment. All outdoor programs, including recreational ones, should promote environmental literacy. Fun should be learning, too. Because most outdoor recreation programs are fundamentally recreational, not educational, it is unreasonable to expect them to provide for a formal program of instruction. However, while education, in at least a basic form, should be an integral part of outdoor programming, too little attention has been paid to systematically programming for education in outdoor recreation programs. By making an effort to systematically incorporate learning as an element of fun, programs can help acclimatize participants to the natural environment, provide skills for life-long leisure, and contribute to participants' sense of social and environmental responsibility. More importantly, programs can promote caring about the environment, and can insure that participants return home with rich, meaningful, and unforgettable memories about their experiences in the outdoors. (Author)

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ED 391 648

Making Fun Learning

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Manuscript for presentation at
Reconnecting with Nature: A Vision for the Future

October 1994

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Making Fun Learning

Author's Note

This document is the script of a presentation made at the Second Coalition for Education in the Outdoors national Conference, Reconnecting with Nature: A Vision for the Future. The conference session offered an opportunity for questions, and included a hand-on learning experience based on a Project Wild activity. The "Figures" in this script were displayed as overhead transparencies during the presentation.

Abstract

Outdoor recreation programs are valuable because they always permit, and always can promote interactions between participants and natural elements of the environment. Because such programs provide direct, personal experience in the outdoors, they should also seek to provide participants with a basic understanding of, and an appreciation for the interrelationships that exist in the environment and between humans and the environment. All outdoor program, including recreational ones, should, at a very basic level, promote environmental literacy. Fun should be learning, too.

Because most outdoor recreation programs are fundamentally recreational, not educational, it is unreasonable to expect them to provide for a formal program of instruction. Nonetheless, there are a number of things that outdoor programs can do to promote learning about the environment -- at every level of their operation. However, while education, in at least a basic form, should be an integral part of outdoor programming, too little attention has been paid to systematically programming for education in outdoor recreation programs.

By making an effort to systematically incorporate learning as an element of fun, programs can help acclimatize participants to the natural environment, provide skills for life-long leisure, and contribute to participants' sense of social and environmental responsibility. More importantly, programs can promote caring about the environment, and can insure that participants return home with rich, meaningful, and unforgettable memories about their experiences in the outdoors.

Background & Introduction

About six years ago, in June of 1988, Parks & Recreation magazine published a short article titled *Ah Wilderness!* (Chase & Gilbert, 1988). Chase and Gilbert, the authors of this article, tried to define the "basics" of outdoor recreation as being concrete skills like knot tying, camp cooking, water purification, and rubbing two boy scouts together to build a fire. They also argued that outdoor recreation programs must focus on *these* basics if they are to be successful.

I agreed then -- and I still agree -- that it is important for outdoor programs to "focus on the basics." But, I have a serious problem with the authors' premise, and I've spent a good part of the last six years arguing against it. The premise to which I object is in their traditional definition of the "basics" in outdoor recreation.

Figure 1

What are the Basics in Outdoor Recreation?

Traditional View:

The basics of outdoor recreation include knot tying, camp cooking, water purification, fire building, and other similar concrete skills

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I am doubtful that traditional views of the "basics" are adequate, because I think there is more to recreating in the outdoors than knowing *how* to do things. Concrete outdoor skills are, I think, no more important to outdoor programs than art skills are to arts & crafts programs, or musical talent to music programs. The actual skills are, of course, a part of these programs, but the essence of the programs is not in the skills themselves. Those of us who can't carry a tune can enjoy participating in group songfests, and those of us with no skills can still have fun in arts and crafts.

An alternative view of the "basics," one that de-emphasizes skills and re-emphasizes interacting with, and learning about other people and the environment can serve us far better.

Figure 2

What are the Basics in Outdoor Recreation?

Alternative View:

The basics of outdoor recreation include an emphasis on interaction with natural elements of the environment and with other people, and learning about the environment and those with whom we share it

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This view makes it reasonable to assert something we all know to be true -- that a participant who can't tie a knot, pitch a tent, build a fire, or tell a birch from a cedar tree can still participate in, benefit from, and enjoy an outdoor program. Given this, we might conclude that what is really important to all outdoor programs is not so much the *content* as the *context*. Many of the real "*basics*" in outdoor programs are part of the outdoors itself.

Incorporating an environmental context

I would suggest that one of the real basics -- one of the essential values of outdoor programs -- is in their ability to permit (or even promote) interaction with natural elements of the environment. In their ability -- as Joseph Cornell described it in Sharing Nature with Children -- to "tune our finer feelings to the special qualities of nature -- her peace and beauty; her energy and grandeur; her mystery and wonder" (Cornell, 1979, p. 9). Outdoor programs should certainly be fun, but, because the outdoors themselves define at least part of the *essence* of the programs, outdoor programs should also seek to provide participants with a basic understanding of, and appreciation for the interrelationships that exist in

the natural world, and between humans and that world. That is to say, they should, at least at a very basic level, promote environmental literacy.

Figure 3

Fun should be learning, too!

Fun should be learning, too.

Creating a Context for Learning

Recreational programs can begin to serve this end by creating a context for learning.

Figure 4

Creating a Context for Learning

Don't Emphasize Formal Programs of Instruction

Do Seek to Promote:

- a sense of respect for the outdoors;
- a culture of respect in the camp;
- appropriate social and environmental behavior;
- a sense of awe and respect for the out-of-doors

Because most outdoor recreation programs are fundamentally recreational, not educational, it is unreasonable to expect them to provide a formal program of instruction -- in environmental ethics or in anything else. Nevertheless, there are a number of things that our programs can do

to promote learning. The first, and most basic step is to foster in program participants a sense of respect for the outdoors.

Almost everyone who walks past the Vietnam Veterans' War Memorial, in Washington D.C. -- for the first time or the hundredth time -- experiences a sense of awe and respect. Almost no one who experiences these profound feelings would consider it appropriate to carve their initials into the Wall, or to carve off a piece of the Wall for a school art project. Outdoor Programs need to do everything they can to create the same sense of awe and respect for the "natural monuments" that comprise the outdoor setting (Schatz, McAvoy, & Parker 1992). In a wilderness or a city's center, the *natural* elements that comprise the environment are memorials to the life that surrounds us, and that life is deserving of respect. Outdoor recreators should, in a really classical sense, think the outdoors are awesome.

If we hope to create a culture of respect in the program, and to foster an appropriate sense of awe in our participants, we must combine lessons in appropriate behavior with an operational philosophy based on these same senses of awe and respect.

Program Operations

A philosophy of operation that *expresses* respect *and concern* for the environment, is, then, essential.

Figure 5

Camp & Program Operations

Model a Philosophy of Environmental Harmony

- practice the "3Rs" (reduce, reuse, recycle)

- practice environmentally friendly planning and management

If our programs do not practice the "3Rs" in their operations -- by reducing, then reusing, and then recycling -- we can not expect our participants to do so in their lives. If we clear-cut a woodlot, fill a wetland, or plow a trail through a meadow to facilitate new construction, we are modeling a strong lesson that might be in conflict with some of the things we hope to teach. Every aspect of an outdoor program, from recruitment to evaluation, and from design to sewage treatment, should be built around environmentally friendly practices, if we hope to deliver a consistent message. We cannot relegate environmental education to nature programs, but, instead, must reflect what McAvoy has called *a philosophy of environmental harmony* in all of our programs (Schatz, McAvoy, & Parker 1992).

Programs and Activities

All of this, of course, is preliminary. If we hope to make fun learning, it is important to make an effort to incorporate opportunities for learning into regularly programmed recreational activities.

Figure 6

Programs and Activities

Incorporate Opportunities for Learning into All Activities

Make use of easily available resources including

- Project Wild
- Project Learning Tree
- Sharing Nature with Children
- Sharing the Joy of Nature
- The New Games Book
- More New Games
- Teaching Kids to Love the Earth

Figure 6
(continued)

- Outdoor Education: A Manual for Teaching in Nature's Classroom
- Silver Bullets
- Cowtails & Cobras
- Minimum Impact Camping: A Basic Guide
- Soft Paths
- Camping Magazine
- Acclimatization
- Acclimatizing
- Sunship Earth

Resources like *Project Wild* (WREEC, 1983a, 1983b, 1986), *Project Learning Tree* (AFC, 1975a, 1975b), and a myriad of other environmental education guides -- several of which are referenced in your handouts -- provide suggestions and activities that are as appropriate in a recreation program as they are in a school or an environmental education center. These easily accessible resources can make integrating education into outdoor programs relatively painless. To aid in that effort, I'd like to try to outline a basic structure for using education in outdoor recreation programs.

Using Education in Outdoor Recreation Programs

To begin that structure, I'd like to suggest that there are at least four good reasons to integrate educational elements into outdoor recreation programs. Education, as a part of outdoor recreation, can help acclimatize participants to the environment, can provide skills for life-long learning and life-long leisure, and, perhaps most importantly, can contribute to participants sense of social and environmental responsibility.

Figure 7

Use "Education" in Recreational Programs to:

Help Acclimatize Participants

Provide a Foundation for Life-long Learning

Provide Skills for Life-long Leisure

Contribute to Participants Sense of Social and Environmental Responsibility

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Acclimatizing Participants

Acclimatizing participants is the first step toward making fun learning.

Participating in outdoor programs usually requires participants to move away from the environments in which they are most comfortable -- home, school or work, and the shopping mall -- and into a new, less familiar environment like a park, residential center, or wilderness area, where they may feel uncomfortable, insecure, or even confused. Before these people can participate fully in a new experience, they must learn to feel comfortable in the environments in which that experience takes place. That is to say, before anyone -- children, or adults -- can begin to enjoy an outdoor program, they need to feel comfortable in the program's social environment as well as in the outdoors itself.

We all know that an ice-breaker or name game at the beginning of a program day can help participants feel comfortable in a new social environment, and can lay a foundation for cooperation later in the program. Well, in a similar way, a game or exercise that helps the program participants "meet" a new environment, can help promote some level of comfort with the natural world, and can lay a foundation for

personal enjoyment and development -- as well as for environmental learning -- later in the program.

Figure 8

Acclimatizing Participants

Promote Comfort

- in the program's social environment
- in the outdoors

Take Time Early to:

- "meet" the program's environment
- look at the scenery
- appreciate the natural world
- teach about the environment
- teach basic skills

Plan Programs Carefully

This is important, because participants who are not comfortable being in the outdoors will have a very hard time focusing on anything other than their own discomfort, and stand little chance of either having fun or learning to enjoy or appreciate the natural world as a thing of beauty. Giving program participants an opportunity to acclimatize, to get used to the program settings, is, then, an essential first step towards developing a sense of comfort.

While the logistics of many programs make it expedient to rush right into whatever it is we are doing without taking time to acclimatize, we really should slow down and encourage new participants to relax at the beginning of a program. To focus attention on the program and its

environment, and off of their own concerns or fears about being away from familiar sights, we should offer participants an opportunity to explore the program setting, to look at the scenery, and to become familiar with the things they see. We might, for example, consider starting our programs with a facility tour that is combined with a sensory *Scavenger Hunt* (Cornell, 1979), or an *Unnature Trail* (Cornell, 1979).

(These two activities, from Sharing Nature with Children, and all of the others that I'll mention today, are referenced and briefly described on page four of your handouts).

Developing our participants' awareness of the elements in a program environment might also include some basic instruction about that environment. New-comers to the outdoors might want to know if there are poisonous snakes lurking in the bushes, if there are lions, or tigers, or bears in the woods, or how they can avoid common dangers like ticks and poison ivy. They might also be afraid to ask -- or worse, they might not know enough about the outdoors to even formulate the questions. Basic instruction about the local environment early in a program can help participants deal with fears before they become a problem, can help improve their levels of comfort, and can give them an opportunity to become concerned about having fun, rather than their own safety. Teaching concrete skills early relates to these same concerns.

Participants in a canoeing program who are afraid they are about to drown will have very little time or attention to devote to experiencing the beauty of the river or lake shore, to learning about their paddling partners, or to enjoying the trip. Basic instruction, in this case in canoeing skills and proper use of a PFD, can help allay such fears, can increase comfort levels, and can offer them at least an opportunity to appreciate, the experience and environment in which the experience is taking place (Schatz, McAvoy & Parker, 1992, 1993).

We must, then, make an effort to carefully prepare our programs, and to fully prepare our participants for them. If our programs are poorly planned (or poorly executed), or if our participants don't eat well or dress appropriately, outdoor programs are, simply, not fun. When programs aren't fun, socially and environmentally friendly behaviors are relegated to a position of minor or non-importance. Participants in a trip camping program, for example, will not enjoy the experience, get along well with others, or appreciate the need to practice minimum impact techniques if

they are cold, wet, and hungry. They'll fight over food, argue about everything, and will want, or perhaps even need, a fire regardless of the impact on the environment. Physically comfortable participants, in contrast, may be more willing to explore new ideas and activities, share with their trip mates, and enjoy the experience for what it is. They might also be more receptive to a discussion of the impact of even small fires on the camping environment, and may be more interested in participating in a fire-free minimum impact camping experience (Schatz, McAvoy & Parker, 1992, 1993).

It is important, then, to help participants fully acclimatize themselves to both *the environment* and to *the experience*, because those who are fully acclimatized are better prepared for fun than those who are not.

Provide Skills for Life-Long Learning

Incorporating learning opportunities in recreational programs also serves to provide a foundation for life-long learning.

Figure 9

Provide Skills for Life-Long Learning

Learning Should be as Natural as Breathing

Recreation is an Educational Medium

- we learn best from direct experience
- recreation can introduce and reinforce conceptual understanding of world

Incorporate Educational Objective in Program Plans

Weave Environmental Education into Regular Programs

- both planned and unplanned activities

Keep Programs Flexible

Learning should be as natural as breathing, but many of us nevertheless expect "education" to be boring and tedious, and, consequently, we often respond negatively to things that we perceive as being focused on teaching or learning. But, in spite of this learned bias, recreational activities are a potentially powerful educational medium. In Sharing Nature with Children, Joseph Cornell suggests that we all "remember concepts best when [we] learn from direct personal experience" (Cornell, 1979, p. 9). Few experiences in or about the outdoors are as direct or personal as those offered through outdoor recreation programs, so these programs *can* help make learning real and rememberable in a way that schools cannot.

Sensory activities (see Cornell, 1979, 1989; Herman, Passineau, Scimpf & Treuer, 1991; WREEC, 1983a, 1983b, 1986; Van Matre, 1972, 1974, 1979), in addition to promoting comfort with the environment, can encourage participants to experience nature directly -- through sight, hearing, smell, taste and textures -- rather than through a cognitive filter. Games or other activities that illustrate environmental concepts can help provide participants with a frame of reference against which they can judge abstract concepts like *adaptation* or *interdependence* that they learn about in school.

A walk through a swamp, where we can experience the feel and smell of the plants and their products in a natural setting, might also include a brief lesson about the processes of plant decomposition or eutrophication. Similarly, a New Games *Lapsit* (Flugelman, 1976) can be adapted into a *Habitat Lapsit* (WREEC, 1983b) that physically mimics the interdependence of various elements of the natural environment and teaches a bit about ecological balance.

By incorporating educational objective in our recreational activities, we can help to awaken participants' enthusiasm, and help to insure that what Cornell called a "sense of joy" permeates the learning experience (Cornell, 1979, p. 14). "Education" in and about the out-of-doors can be fun, and can promote a positive attitude toward the experience, toward the environment, and toward the process of learning it self.

So, instead of separating learning about the outdoors into a "naturalist program," we can, and should -- as I have already suggested -- weave environmental education into our regular programs. The check

points on an orienteering course might be located at sites with interesting or unique environmental characteristics. A crafts program might focus on painting with natural pigments, or making paper or *Fish Prints* (WREEC, 1983b) rather than on braiding lanyards. Our programs can become a medium for some very strong educational messages -- and environmental messages -- if we incorporate small lessons into all of our regular programmed activities.

We can also incorporate learning opportunities into our unplanned activities. A snowball fight can easily lead into a lesson about the unique characteristics of snowflakes; a walk on the beach can incorporate looking for, and learning about animal tracks; or an unexpected fall into a mud puddle can lead to an impromptu study of a micro-environment.

Keeping programs flexible enough that participants' questions or discoveries can lead them in new directions, and keeping attitudes flexible enough that the outcomes are more important than the plans helps make outdoor programs a more positive experience, and a more beneficial one, for everyone involved.

By introducing learning through what are essentially recreational activities, we can, or so Cornell suggests in Sharing the Joy of Nature, "create a base of alertness and enthusiasm on which [we] can build subtler, more meaningful learning experiences" (Cornell, 1989, p. 29). This base, surely provides a foundation for life-long learning, and just as surely makes our outdoor programs richer and more meaningful.

Provide Skills for Life-Long Leisure

The more traditional concrete skills Chase and Gilbert identified as the "basics" in their article (Chase & Gilbert, 1988), certainly have a role in outdoor programs. It is these skills, and others like them, that provide a foundation for life-long leisure.

Recreational activities can clearly help our participants develop skills that they can use throughout their lives -- to access the natural world, and to enrich their personal development and social interactions. Minimum impact camping skills can be part of almost any outdoor program, and even specialty programs can use low impact activities like

hiking, canoeing, and cross-country skiing to transport participants from one activity to another. Basic skill instruction in cooking, hiking, outdoor

Figure 10

Provide Skills for Life-Long Leisure

Help Campers Develop Concrete Skills They Can Use Throughout Their Lives

- to access to out-of-doors
- as life-leisure skills
  - for social recreation
  - for personal development

Use Skills as a Medium for Other Learning

- about cultures
- about environment

Promote Socially and Environmentally Friendly Behaviors

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games, writing and reading, arts and music, and a wide range of other leisure activities is easy to integrate into a program.

Resident programs can have a quiet reading and writing hour before bed time, and day programs can introduce small group games during "rainy-day" periods. Skill instruction can easily incorporate "lessons" about different cultures (by, for example, comparing Ojibwa snowshoes to modern American shoes) and about the environment (by focusing, for example, on which trees make the best canoes); they can introduce participants to useful leisure skills; and, even if teaching activities like canoeing, bridge, or Trivial Pursuits does not directly serve the mission of a program, it can serve that mission indirectly by modeling and promoting pro-social behaviors that are non-consumptive, and environmentally friendly. At the same time, such activities can make the

program more attractive to participants, and provide them with improved access to opportunities for life-long leisure.

Promoting Social and Environmental Responsibility

The most important skills programs can provide, however, go beyond recreation and leisure. Phyllis Ford (1981) has suggested that the ultimate goal of all outdoor programs is to provide participants with the skills of good citizenship. To that effect, I would suggest that the most important contribution education can make to recreational programs is promoting socially and environmentally responsible behaviors.

Figure 11

Promote Social and Environmental Responsibility

Teach and Model Minimum Impact Recreation

minimize impacts on

- self
- others' experience
- the environment

Focus on Skills and Their Application

minimum impact ethic
interaction effects

Promote Cooperation and Problem Solving Skills

initiative games
cooperative games
problem solving exercises

Integrate a Variety of Skills into the Students Playing and Learning Experiences

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While minimum impact camping evolved from a need to protect the delicate ecosystems of North America's wilderness areas, it is possible, and important, to extend the ideals of minimum impact to *all* of our recreation activities (Schatz & Seemon, 1994).

We can preserve the environmental and social characteristics of the outdoors that make outdoor recreation attractive only by minimizing the negative impacts of our recreation. Consequently, if we teach skills, we must also teach the ethical application of skills by stressing that this ethic necessitates minimizing negative impacts on ourselves, on other people and their experiences, and on the environment.

In teaching about socially and environmentally friendly behaviors, we must also place an emphasis on what Leo McAvoy has called the interaction effects between recreational behaviors and elements of the non-human environment. Leaving food out to attract animals might, for example, make it possible for participants to take better pictures, or experience new thrills. But this behavior, which is not in itself "bad" may have some negative impacts. Leaving food out in an area accessible to bears both attracts bears, and teaches them that the area is a good place to get dinner. Once a bear has learned this lesson, it has a tendency to stop by regularly looking for a free meal. It may eventually become enough of a nuisance that it must be trapped and relocated or, in a far more likely scenario, shot and killed to reduce the likelihood that it will destroy property or injure someone (Schatz, McAvoy & Parker, 1992, 1993). In a similar vein, it is important to recognize that biking or hiking off of hardened trails may promote erosion, and erosion, in turn, might cause silt to reduce fish populations in a nearby stream or pond; or, that picking too many berries can kill a mouse -- and for want of a mouse, a fox may die, and for want of a fox, the kingdom may fall (Schatz & Seemon, 1994).

We also need to emphasize minimum impact skills in recreation and in living by modeling friendly behaviors and by teaching participants about the reasons some techniques or behaviors are more friendly than others. However, while it is important, an emphasis on minimizing recreational impacts is not the only contribution recreation can make toward developing the skills of good citizenship.

Recreational activities, particularly cooperative and initiative games (see Flugelman, 1976, 1981; Rohnke, 1984, 1989) can give program participants an opportunity to develop and practice their social and problem solving abilities in a non-threatening atmosphere, and can provide them with models they can apply to problems throughout their lives.

Games like *Human Knots* (Flugelman, 1976), *Yurt Circle* (Flugelman, 1981), and *By the Light of the Moon* (Herman, et al., 1991) are fun ways to fill a few minutes, but, these games also teach valuable lessons about cooperation, trust, and communication. In addition to introducing or reinforcing environmental concepts, they physically demonstrate to players what it means to be socially responsible, and what can happen to their "society" if they aren't.

Playful problem solving activities, like *What did Your Lunch Cost Wildlife* (WREEC, 1983a, 1983b), are easy to integrate into outdoor programs as "filler" but they also serve to illustrate the basics of problem solving in an environmental context. Similar homework-like exercises, like the *Urban Nature Search* (WREEC, 1983b), can be introduced in a program to help participants generalize their learning to different environments.

By integrating a variety of skills into our playing and learning experiences these, and similar activities can help meet Ford's (1981) standard of promoting participants' ability to function effectively in society. When it is integrated into recreational programs, education can, then, promote behaviors that are both socially and environmentally responsible.

Conclusion

Outdoor programs are generally focused on providing a positive recreational experience, but they must also seek to provide a positive learning experience because, in a very real sense, education is an *essential* component of recreation. Awareness of the environment, understanding the environmental outcomes of human behavior, and developing a sense of respect for the living world are all as natural and integral a part of an outdoor recreation experience as is fun. A positive outdoor experience

should, then, help participants to develop a sense of personal identity with the natural world.

To foster this sense of identity, it is important for outdoor programs to teach environmental sensitivity and to avoid setting up the natural world as an adversary to be overcome. To foster our participants' personal growth and development, we have an obligation to teach not only skills for playing in the outdoors, but also something about the world in which those skills will be used. By including this educational component, we can make environmental literacy a part of the outdoor experience -- and make fun learning, too.

I'd like to take about ten minutes to answer questions, if you have them, before we move on to a recreational activity with what I hope are educational overtones.

QUESTION AND ANSWER SESSION

I had a hard time planning this session, because I'm not familiar with the conference, and I had no idea how many people would be here, or how excited you'd be about what I have to offer. So, I went through my cupboards to see what supplies I had on hand, and planned this activity based on that. I hope it works.

Introduction to "Hands on" Activity

This activity is from the Project Wild Aquatic activity guide, and I have used it both as a "rainy day" activity, and as a part of arts and crafts program. It is called "Fashion a Fish," and it can, though it need not be, introduced with a bit of a lesson on adaptations.

Many of you are, no doubt, aware that fish have, over the years, adapt to their habitats. You might not, however, be aware of just what those adaptations are. Four primary adaptations that allow fish to survive

in different areas are their mouth and body shapes, their coloration, and their method of reproduction.

Display Overhead 12 About Here

Sucker Shaped Mouths, like a carp's, allow the fish to vacuum up very small plants and animals at meal times; *Elongated Upper Jaws*, like a spoonbill's or sturgeon's, allow the fish to more easily capture prey that it attacks from above, and *Elongated Lower Jaws*, like a barracuda's, let it catch prey attacked from below. *Duckbill Jaws*, like a muskie or pike's allow the fish to grasp their prey; and *Extremely Large Jaws*, like a large mouth bass', let the fish easily engulf its dinner.

Display Overhead 13 About Here

Torpedo Shape fish, like salmon, can move very quickly through the water, while *Flat Bellied* catfish, and the like, move more slowly along on the bottom. *Vertical Disk* fish, like bluegills, can more easily move up and down through the water to feed, while *Horizontal Disk* fish, like flounder, can live easily on the ocean's floor. And, finally, *Hump Backed* fish, like sockeye and chub, have a body shape that makes them more stable in fast moving water.

Display Overhead 14 About Here

Fish with *Light Colored Bellies* blend in with the water's surface and are more difficult to see from below, fish with *Dark Uppersides* are just as difficult to see from above, because they blend in with the lake's darker bottom. Both *Vertical Stripes* and *Horizontal Stripes* allow fish to hide more easily in vegetation, and motley spots allow the fish to hide in rocks or on a grainy bottom.

Display Overhead 15 About Here

Eggs Deposited on the bottom of a lake or stream are hidden from predators, but they also can't be protected by an adult like those that are deposited in nests. Floating eggs can be dispersed in high numbers, improving the likelihood of finding a good home, while those that are attached to vegetation are more stable, and more likely to hatch. Live bearing fish deliver fewer babies than their egg laying counterparts, but they have a much higher survival rate.

Method

I would like you to get into groups of about four for this exercise. As soon as you have your group together -- and you've all introduced yourselves -- I'll give you a set of adaptation cards that will describe the characteristics of the fish I want you to fashion.

Using the supplies I have on the table -- as well as anything you brought with you -- I'd like you to create a fish based on your set of cards, name it, and create a habitat for it. If we have time at the end of the session, you'll have a chance to introduce your creations to the rest of the group.

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